

1. A method for performing initial ranging in conjunction with a contention-based Medium Access Control (MAC) protocol in a shared-medium communication network, the method comprising the steps of:

taking a first system performance measurement to obtain a first probability of

5 success outcomes using a first backoff window size;

taking a second system performance measurement to obtain a second probability of success outcomes using a second backoff window size different than the first backoff window size; and

determining a third backoff window size based on the first and second system

10 performance measurements.

2. The method of claim 1 wherein:

the step of taking the first system performance measurement comprises:

providing ranging opportunities and specifying the first backoff window

15 size for collision resolution;

counting a first number of success outcomes in a first sample of N ranging opportunity slots; and

determining the first probability of success outcomes equal to the first number of success outcomes divided by N; and

20 the step of taking the second system performance measurement comprises:

providing additional ranging opportunities and specifying the second backoff window size for collision resolution;

skipping a number of ranging opportunity slots at least equal to the first backoff window size;

25 counting a second number of success outcomes in a second sample of N ranging opportunity slots; and

determining the second probability of success outcomes equal to the second number of success outcomes divided by N.

30 3. The method of claim 2 wherein N is a predetermined sample size equal to twenty (20) ranging opportunity slots.

4. The method of claim 2 wherein the step of determining the third backoff window size comprises:

5 determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size;

10 setting the third backoff window size greater than the second backoff window size, if the ratio R is a positive value; and

15 setting the third backoff window size less than the second backoff window size, if the ratio R is a negative value.

20 5. The method of claim 4 wherein:

25 the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and

30 the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.

35 6. The method of claim 2 wherein the step of taking the second system performance measurement further comprises:

40 counting a number of garbled outcomes in the second sample of N ranging opportunity slots; and

45 determining a probability of garbled outcomes equal to the number of garbled outcomes divided by N.

50 7. The method of claim 6 wherein the step of determining the third backoff window size comprises:

55 determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a

denominator equal to the second backoff window size minus the first backoff window size;

setting the third backoff window size greater than the second backoff window size, if either:

5           the ratio R is greater than or equal to zero, and the probability of garbled outcomes is greater than 0.3; or

              the probability of garbled outcomes is greater than 0.8; and

              setting the third backoff window size less than the second backoff window size otherwise.

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8.       The method of claim 7 wherein:

             the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and

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             the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.

9.       The method of claim 1 wherein the MAC protocol is a Multimedia Cable Network System (MCNS) protocol.

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10. An apparatus comprising a computer usable medium having embodied therein  
a computer readable program for performing initial ranging in conjunction with a  
contention-based Medium Access Control (MAC) protocol in a shared-medium  
communication network, the computer readable program comprising computer  
5 readable program instructions enabling a computer to perform the steps of:

    taking a first system performance measurement to obtain a first probability of  
success outcomes using a first backoff window size;

    taking a second system performance measurement to obtain a second  
probability of success outcomes using a second backoff window size different than  
10 the first backoff window size; and

    determining a third backoff window size based on the first and second system  
performance measurements.

11. The apparatus of claim 10 wherein:

15     the step of taking the first system performance measurement comprises:

        providing ranging opportunities and specifying the first backoff window  
size for collision resolution;

        counting a first number of success outcomes in a first sample of N  
ranging opportunity slots; and

20     determining the first probability of success outcomes equal to the first  
number of success outcomes divided by N; and

    the step of taking the second system performance measurement comprises:

        providing additional ranging opportunities and specifying the second  
backoff window size for collision resolution;

25     skipping a number of ranging opportunity slots at least equal to the first  
backoff window size;

        counting a second number of success outcomes in a second sample of  
N ranging opportunity slots; and

30     determining the second probability of success outcomes equal to the  
second number of success outcomes divided by N.

12. The apparatus of claim 11 wherein N is a predetermined sample size equal to twenty (20) ranging opportunity slots.
13. The apparatus of claim 11 wherein the step of determining the third backoff window size comprises:
- determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size;
- 10 setting the third backoff window size greater than the second backoff window size, if the ratio R is a positive value; and
- setting the third backoff window size less than the second backoff window size, if the ratio R is a negative value.
- 15 14. The apparatus of claim 13 wherein:
- the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and
- the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.
- 20 15. The apparatus of claim 11 wherein the step of taking the second system performance measurement further comprises:
- 25 counting a number of garbled outcomes in the second sample of N ranging opportunity slots; and
- determining a probability of garbled outcomes equal to the number of garbled outcomes divided by N.
- 30 16. The apparatus of claim 15 wherein the step of determining the third backoff window size comprises:

determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size;

5 setting the third backoff window size greater than the second backoff window size, if either:

the ratio R is greater than or equal to zero, and the probability of garbled outcomes is greater than 0.3; or

the probability of garbled outcomes is greater than 0.8; and

10 setting the third backoff window size less than the second backoff window size otherwise.

17. The apparatus of claim 16 wherein:

the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and

the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.

20 18. The apparatus of claim 10 wherein the MAC protocol is a Multimedia Cable Network System (MCNS) protocol.

25 19. The apparatus of claim 10 wherein the computer readable program comprises:

computer readable program code means for taking the first system performance measurement to obtain the first probability of success outcomes using the first backoff window size;

computer readable program code means for taking the second system performance measurement to obtain the second probability of success outcomes 30 using the second backoff window size different than the first backoff window size; and

~~computer readable program code means for determining the third backoff window size based on the first and second system performance measurements.~~

20. A data signal embodied in a carrier wave, wherein embodied in the data signal is a computer readable program for performing initial ranging in conjunction with a contention-based Medium Access Control (MAC) protocol in a shared-medium communication network, the computer readable program comprising computer
- 5 readable program instructions enabling a computer to perform the steps of:
- taking a first system performance measurement to obtain a first probability of success outcomes using a first backoff window size;
- taking a second system performance measurement to obtain a second probability of success outcomes using a second backoff window size different than
- 10 the first backoff window size; and
- determining a third backoff window size based on the first and second system performance measurements.
21. The data signal of claim 20 wherein:
- 15 the step of taking the first system performance measurement comprises:
- providing ranging opportunities and specifying the first backoff window size for collision resolution;
- counting a first number of success outcomes in a first sample of N ranging opportunity slots; and
- 20 determining the first probability of success outcomes equal to the first number of success outcomes divided by N; and
- the step of taking the second system performance measurement comprises:
- providing additional ranging opportunities and specifying the second backoff window size for collision resolution;
- 25 skipping a number of ranging opportunity slots at least equal to the first backoff window size;
- counting a second number of success outcomes in a second sample of N ranging opportunity slots; and
- determining the second probability of success outcomes equal to the
- 30 second number of success outcomes divided by N.

22. The data signal of claim 21 wherein N is a predetermined sample size equal to twenty (20) ranging opportunity slots.
23. The data signal of claim 21 wherein the step of determining the third backoff window size comprises:
- determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size;
- 10 setting the third backoff window size greater than the second backoff window size, if the ratio R is a positive value; and
- setting the third backoff window size less than the second backoff window size, if the ratio R is a negative value.
- 15 24. The data signal of claim 23 wherein:
- the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and
- the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.
- 20 25. The data signal of claim 21 wherein the step of taking the second system performance measurement further comprises:
- 25 counting a number of garbled outcomes in the second sample of N ranging opportunity slots; and
- determining a probability of garbled outcomes equal to the number of garbled outcomes divided by N.
- 30 26. The data signal of claim 25 wherein the step of determining the third backoff window size comprises:

determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size;

5 setting the third backoff window size greater than the second backoff window size, if either:

the ratio R is greater than or equal to zero, and the probability of garbled outcomes is greater than 0.3; or

the probability of garbled outcomes is greater than 0.8; and

10 setting the third backoff window size less than the second backoff window size otherwise.

27. The data signal of claim 26 wherein:

the step of setting the third backoff window size greater than the second backoff window size comprises setting the third backoff window size equal to twice the second backoff window size; and

the step of setting the third backoff window size less than the second backoff window size comprises setting the third backoff window size equal to half the second backoff window size.

20 28. The data signal of claim 20 wherein the MAC protocol is a Multimedia Cable Network System (MCNS) protocol.

25 29. The data signal of claim 20 wherein the computer readable program comprises:

computer readable program code means for taking the first system performance measurement to obtain the first probability of success outcomes using the first backoff window size;

30 computer readable program code means for taking the second system performance measurement to obtain the second probability of success outcomes

using the second backoff window size different than the first backoff window size; and

computer readable program code means for determining the third backoff window size based on the first and second system performance measurements.

30. A device for performing initial ranging in conjunction with a contention-based Medium Access Control (MAC) protocol in a shared-medium communication network, the device comprising adaptive initial ranging logic operably coupled to provide ranging opportunities and to adjust a backoff window size based on the ranging opportunity outcomes, the adaptive initial ranging logic:

5 providing ranging opportunities and specifying a first backoff window size for collision resolution;

counting a first number of success outcomes in a first sample of N ranging opportunity slots;

10 determining a first probability of success outcomes equal to the first number of success outcomes divided by N;

providing additional ranging opportunities and specifying a second backoff window size for collision resolution;

15 skipping a number of ranging opportunity slots at least equal to the first backoff window size;

counting a second number of success outcomes in a second sample of N ranging opportunity slots;

determining a second probability of success outcomes equal to the second number of success outcomes divided by N;

20 determining a ratio R having a numerator equal to the second probability of success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size; and

25 selecting a third backoff window size based on at least the ratio R.

31. The device of claim 30 wherein N is a predetermined sample size equal to twenty (20) ranging opportunity slots.

32. The device of claim 30 wherein:

30 the adaptive initial ranging logic sets the third backoff window size greater than the second backoff window size, if the ratio R is a positive value; and

the adaptive initial ranging logic sets the third backoff window size less than the second backoff window size, if the ratio R is a negative value.

33. The device of claim 30 wherein the adaptive initial ranging logic:

5 counts a number of garbled outcomes in the second sample of N ranging opportunity slots;

determines a probability of garbled outcomes equal to the number of garbled outcomes divided by N; and

10 selects the third backoff window size based on the ratio R and the probability of garbled outcomes.

34. The device of claim 33 wherein:

the adaptive initial ranging logic sets the third backoff window size greater than the second backoff window size, if either:

15 the ratio R is greater than or equal to zero, and the probability of garbled outcomes is greater than 0.3; or

the probability of garbled outcomes is greater than 0.8; and

the adaptive initial ranging logic sets the third backoff window size less than the second backoff window size otherwise.

20 35. The method of claim 30 wherein the MAC protocol is a Multimedia Cable Network System (MCNS) protocol.

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36. A system comprising a primary station in communication with a number of secondary stations, wherein the primary station includes adaptive initial ranging logic operably coupled to provide ranging opportunities and to adjust a backoff window size based on the ranging opportunity outcomes, the adaptive initial ranging logic:
- 5        providing ranging opportunities and specifying a first backoff window size for collision resolution;
- counting a first number of success outcomes in a first sample of N ranging opportunity slots;
- determining a first probability of success outcomes equal to the first number of
- 10      success outcomes divided by N;
- providing additional ranging opportunities and specifying a second backoff window size for collision resolution;
- skipping a number of ranging opportunity slots at least equal to the first backoff window size;
- 15      counting a second number of success outcomes in a second sample of N ranging opportunity slots;
- determining a second probability of success outcomes equal to the second number of success outcomes divided by N;
- determining a ratio R having a numerator equal to the second probability of
- 20      success outcomes minus the first probability of success outcomes and a denominator equal to the second backoff window size minus the first backoff window size; and
- selecting a third backoff window size based on at least the ratio R.
- 25    37. The device of claim 36 wherein N is a predetermined sample size equal to twenty (20) ranging opportunity slots.
38. The device of claim 36 wherein:
- the adaptive initial ranging logic sets the third backoff window size greater
- 30      than the second backoff window size, if the ratio R is a positive value; and

the adaptive initial ranging logic sets the third backoff window size less than the second backoff window size, if the ratio R is a negative value.

39. The device of claim 36 wherein the adaptive initial ranging logic:

5 counts a number of garbled outcomes in the second sample of N ranging opportunity slots;

determines a probability of garbled outcomes equal to the number of garbled outcomes divided by N; and

10 selects the third backoff window size based on the ratio R and the probability of garbled outcomes.

40. The device of claim 39 wherein:

15 the adaptive initial ranging logic sets the third backoff window size greater than the second backoff window size, if either:

the ratio R is greater than or equal to zero, and the probability of garbled outcomes is greater than 0.3; or

the probability of garbled outcomes is greater than 0.8; and

20 the adaptive initial ranging logic sets the third backoff window size less than the second backoff window size otherwise.

41. The method of claim 36 wherein the MAC protocol is a Multimedia Cable Network System (MCNS) protocol.